

NOTES ON THE LIFE HISTORY OF *SITTICUS FASCIGER* (SIMON, 1880) (ARANEIDA, SALTICIDAE)

Seiji Matsumoto

Department of Biology
Kyorin University
20-2, Shinkawa 6, Mitaka-shi
Tokyo 181, Japan

and

Yasunosuke Chikuni

4810, Toyoshina-cho, Minami-Azumi-gun
Nagano 399-82, Japan

ABSTRACT

In the field in Nagano Prefecture, mature females of *Sitticus fasciger* (Simon, 1880) oviposit several times from June to July in their nests. The nest for oviposition is made in a cavity on a wall. The egg-mass size of reared spiders varies from six to 13 eggs. Spiderlings molt five or six times and mature in late July to early August of the next year from hatching. The duration from egg to adult, which includes days of overwintering, varies from 377 to 428 days. A few adults copulate before overwintering, however, the majority copulate in May or June of the year following maturation. All females oviposit in early summer of the year following maturation. It was confirmed that the life history of this species in Nagano Prefecture is a two-year cycle. The population of this species in Nagano Prefecture consists of two groups in which their generation cycles differ from each other. It seems that the mechanism avoiding the reproductive isolation among these two groups is the intergenerational copulation between just matured females and surviving males which matured in the previous year.

INTRODUCTION

In a previous paper (Matsumoto and Chikuni 1980) we described the jumping spider, *Sitticus fasciger* (Simon, 1880), based on Japanese specimens together with its collecting localities. At that time, this spider was little known in Japan. In the present paper, we report the life history of this species.

It was confirmed by rearing that the life history of this species is a two-year cycle. However, in the field in Nagano Prefecture, mature males and females appear every year and oviposition is also found every year. This discrepancy means that there must be two different groups in a population, i.e., one matures in even years, but the other in odd years, respectively. If this is true, reproductive isolation should occur between these two groups. We discuss the mechanism resolving the possibility of reproductive isolation.

METHOD OF REARING

To obtain their eggs, adult females of *Sitticus fasciger* were collected from Toyoshina-cho, Nagano Prefecture, in 1979 and 1980. Nymphs emerging from their egg-cocoons were reared individually in glass vials of 20 mm in diameter. A drosophilid fly was given to each spider as food every day. The temperature and humidity of the rearing room were not controlled. After the rearing from May to October, the spiders were kept in a room without food and water until early spring of the next year, because the spiders in the field disappeared during this period for overwintering. We obtained 10 mature spiders from about 30 nymphs. The following discussion was based on the rearing records of these 10 spiders.

RESULTS

Habitat.—One of the authors, Chikuni, found *Sitticus fasciger* for the first time in a room of a farmhouse in Misato-mura, Nagano Prefecture, in 1937 and thereafter he has often found them on the walls of farmhouses. Collecting sites of the specimens preserved by the other author, Matsumoto, were related to man-made structures, i.e., the campus of Tokyo Education University, a shrine in Kita-Chigasaki of Kanagawa Prefecture, and Tachikawa railway station of Tokyo (Matsumoto and Chikuni 1980). The type specimen of this species had also been collected from a man-made structure, i.e., “les jardins du Palais d’Ete” near Peking, China (Simon 1880). According to Cutler (1965) and Prószyński (1968), this spider lives on stone walls, on rock outcrops, on wooden sheds and in greenhouses. Prószyński (1968) mentioned that this spider and *Sitticus terebratus* (Clerck, 1758) live on the surfaces exposed to the sun, e.g., rocks, tree trunks, walls and fences.

Active period in the field.—In the field in Toyoshina-cho, Nagano Prefecture, *Sitticus fasciger* appears in late May and disappears before November. Abundance of the species becomes highest in July and August. Immatures which seem to be first nymphs are found in July, although both the matures and the immatures are seen in the field throughout their active periods from late May to October.

In other localities than Nagano Prefecture, the active period of the species is unknown. However, a last nymph was collected on April 24 from Tokyo Education University (Tokyo), and a female on April 21 from Kita-Chigasaki (Kanagawa) and a female on May 19 from Tachikawa (Tokyo) (Matsumoto and Chikuni 1980).

Oviposition.—In the field in Nagano Prefecture, mature females oviposit from June to July in their nest made in the cavities on walls. In rearing, a female produces two to six egg-cocoons successively from June to July; the average number of egg-cocoons per female was four. The female stays in her nest for several days after oviposition, and then goes out for hunting. The intervals between respective ovipositions vary from eight to 34 days, and the average was 20 days. The egg-mass sizes were between six and 13 eggs. In one female, the egg-mass size decreased according to the order of oviposition. The egg is whitish yellow, sub-spherical and 1.2 mm in diameter of long axis (Fig. 1).

Hatching and emerging.—Larvae hatch on the average from their eggs simultaneously after 17 days from oviposition and their body length is 1.6 mm

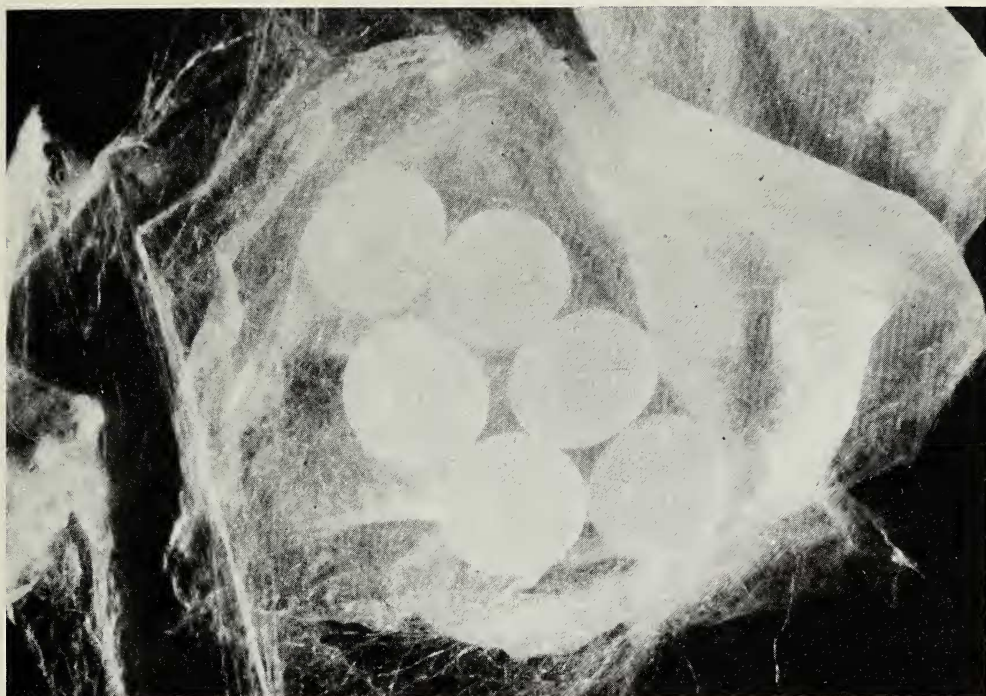


Fig. 1.—Eggs of *Sitticus fasciger*. The egg-cocoon was dissected to show the eggs within.

(Fig. 2). The larvae molt their integuments on the average after 10 days from hatching. The first nymphs stay in the cocoon for an additional five or six days, and then they leave their mother's nest (Fig. 3). Three or four days are required for all nymphs to leave the nest. The first nymphs do not cluster near each other after emerging as those of *Araneus*, *Argiope*, *Dolomedes* and some others do (Bristowe 1958; Matsumoto et al. 1976).

Postembryonic development.—Nymphs of the spiders are found throughout the active period of this species from late May to October in the field of Toyoshinacho. Body sizes of nymphs increase gradually with time. In July, however, the quite small nymphs which are suspected to be the first nymphs are observed together with much larger nymphs.

It is found from rearing that the second molt occurs after 20 to 53 days from emerging. Two individuals molted again within the year and then overwintered (A and D in Table 1). The second and third nymphs begin to molt in mid-June to early July of the next year. Duration of the third instar varies from 18 to 44 days and that of the fourth instar from 18 to 40 days. After the fifth molting, four spiders matured, but the six remaining molted again after 25 to 32 days and then matured (Table 1).

The mortality of reared individuals was quite high in both the periods of the first instar and overwintering.

Maturation and copulation.—It is difficult to know the maturation season in the field, because mature spiders were always found during the active period from May to October. In rearing, maturation occurred during the period from late July to mid-September (Table 1, Fig. 4). The copulatory organs of the female and the male are shown in Figs. 5-8. The duration from egg to adult containing days of overwintering period varies from 377 to 428 days. Those individuals which

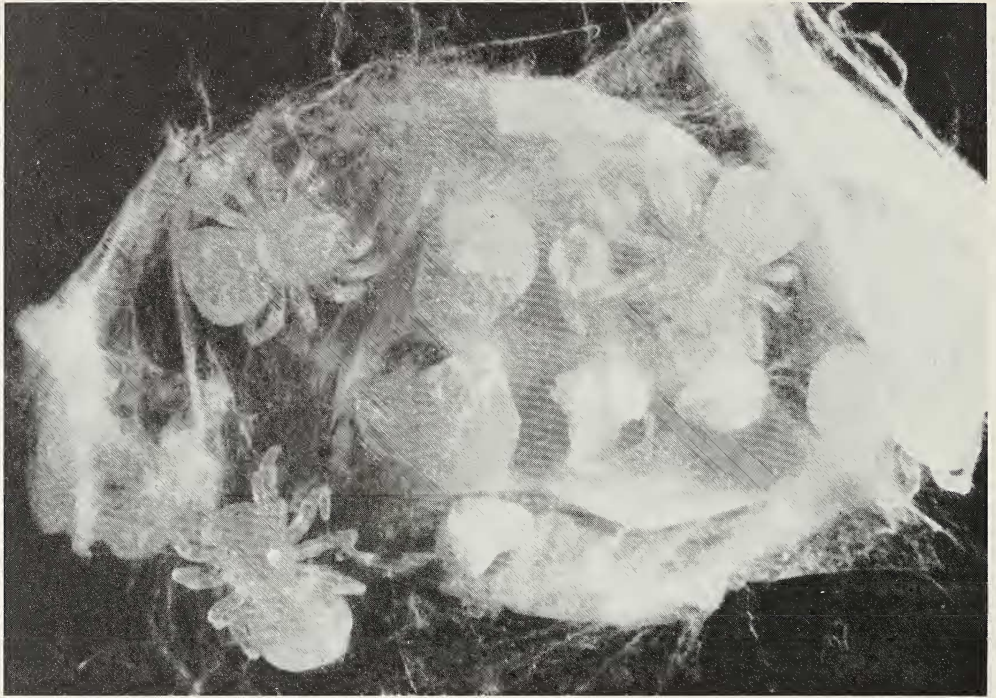


Fig. 2.—Larvae of *Sitticus fasciger*. Two of them are just hatching out of the eggs.

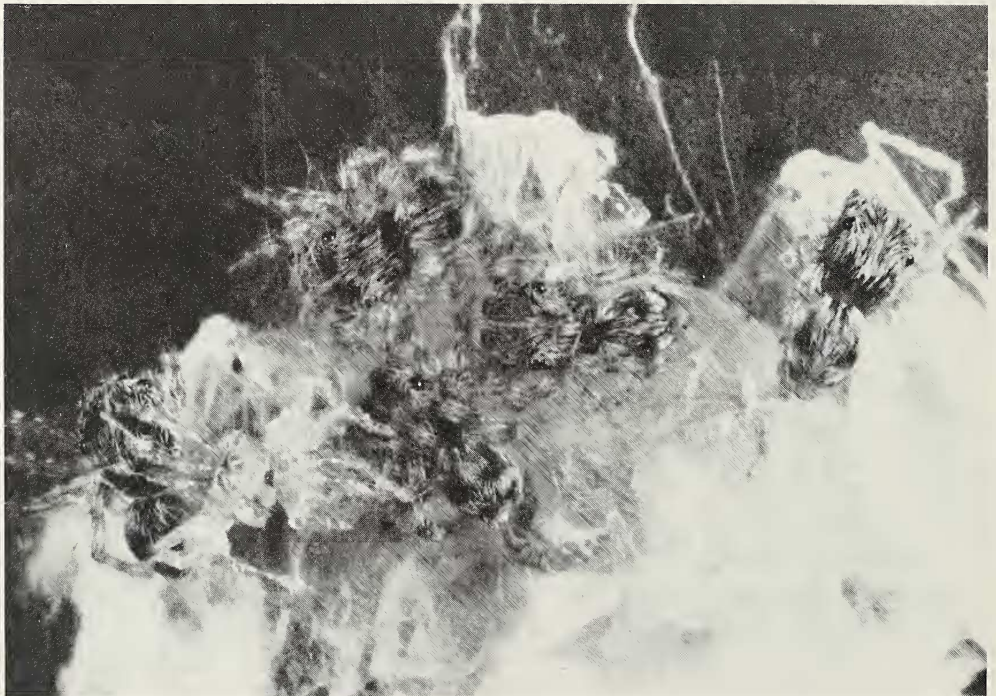


Fig. 3.—The first nymphs of *Sitticus fasciger*. They leave their mother's nest at five or six days after the first molt.

Table 1.—Dates of oviposition, hatching, emerging and molting in the spider, *Sitticus fasciger* (Simon, 1880), collected and reared in Nagano Prefecture, Japan. Spiders (E, F, H & I) matured after the 5th molt and the others after the 6th molt.

	Oviposition	Hatching	1st molt	Emerging	2nd molt	3rd molt	4th molt	5th molt	6th molt
A (♂)	19.JUL.79	5.AUG.79	15.AUG.79	20.AUG.79	9.SEP.79	27.SEP.79	20.JUN.80	10.JUL.80	5.AUG.80
B (♂)	19.JUL.79	5.AUG.79	15.AUG.79	20.AUG.79	30.SEP.79	15.JUN.80	3.JUL.80	26.JUL.80	24.AUG.80
C (♂)	19.JUL.79	5.AUG.79	15.AUG.79	20.AUG.79	22.SEP.79	18.JUN.80	18.JUL.80	12.AUG.80	7.SEP.80
D (♀)	19.JUL.79	5.AUG.79	15.AUG.79	20.AUG.79	9.SEP.79	10.OCT.79	15.JUN.80	25.JUL.80	25.AUG.80
E (♀)	19.JUL.79	5.AUG.79	15.AUG.79	20.AUG.79	30.SEP.79	18.JUN.80	5.JUL.80	30.JUL.80	—
F (♀)	27.JUL.79	12.AUG.79	23.AUG.79	28.AUG.79	28.SEP.79	18.JUN.80	19.JUL.80	16.AUG.80	—
G (♀)	27.JUL.79	12.AUG.79	23.AUG.79	28.AUG.79	10.OCT.79	5.JUL.80	18.JUL.80	10.AUG.80	11.SEP.80
H (♀)	20.JUN.80	7.JUL.80	19.JUL.80	25.JUL.80	4.SEP.80	19.JUN.81	13.JUL.81	31.JUL.81	—
I (♀)	20.JUN.80	7.JUL.80	19.JUL.80	25.JUL.80	16.SEP.80	30.JUN.81	19.JUL.81	22.JUL.81	—
J (♀)	13.JUL.80	31.JUL.80	12.AUG.80	18.AUG.80	29.SEP.80	17.JUN.81	23.JUL.81	15.AUG.81	9.SEP.81

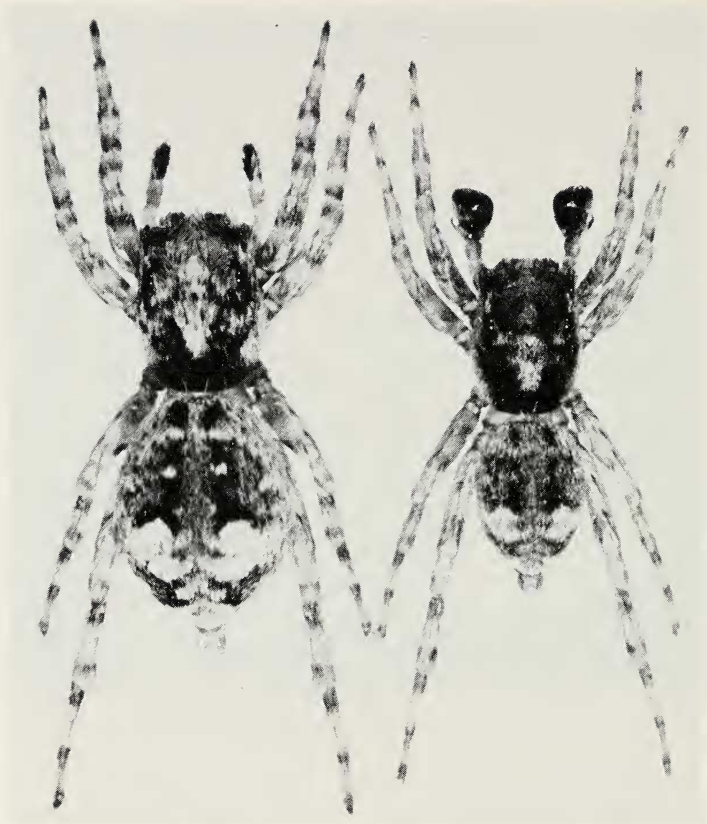


Fig. 4.—Female (left) and male (right) of *Sitticus fasciger*.

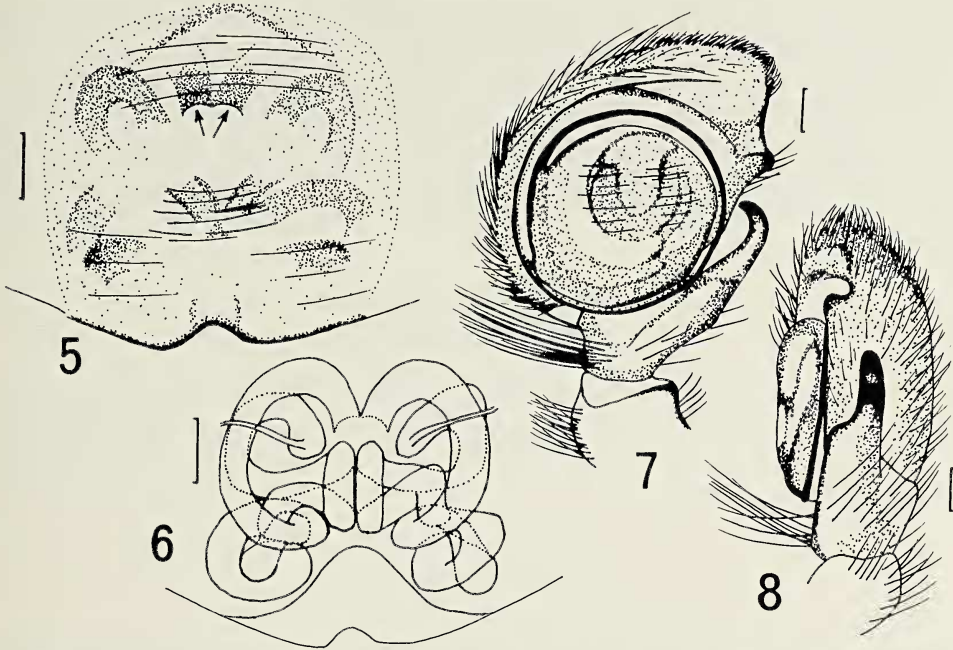
matured by early August copulate in some cases before overwintering, although the majority copulate in May or June of the next year.

Longevity.—In rearing, the physiological death of mature spiders occurred during their third overwintering. As a result, the longevity of this spider extends more than 800 days.

DISCUSSION

The habitats of *Sitticus fasciger* are those places which are accompanied by artificial structures, e.g. stone walls, wooden sheds, buildings, greenhouses and farmhouses (Prószyński 1968; Matsumoto and Chikuni 1980). We agree with Gertsch's opinion (in Prószyński 1968) that this spider is really an introduced species to North America, because it is extremely probable that the spider is able to be easily transferred by humans.

According to field observations, it is considered that oviposition occurs every year, since the first nymphs are found every year. On the other hand, it became clear from rearing that maturation is carried out until late summer of the year following hatching, but mating and oviposition seem to be postponed by late spring of the third year. These facts indicate that the population of this species in Nagano Prefecture consists of two groups in which the generation cycles differ from each other. If such a situation becomes perfect, reproductive isolation must



Figs. 5-8.—Copulatory organs of *Sitticus fasciger*: 5,6, female epigynum; 5, ventral view, arrows show the copulatory openings; 6, dorsal view; 7,8 male palpus; 7, ventral view; 8, retrolateral view. All scale lines: 0.1 mm.

be established between these two groups. We have ascertained by rearing that a few spiders copulated in the late summer of their maturation year and that all spiders survived until the winter after copulation and oviposition. These facts

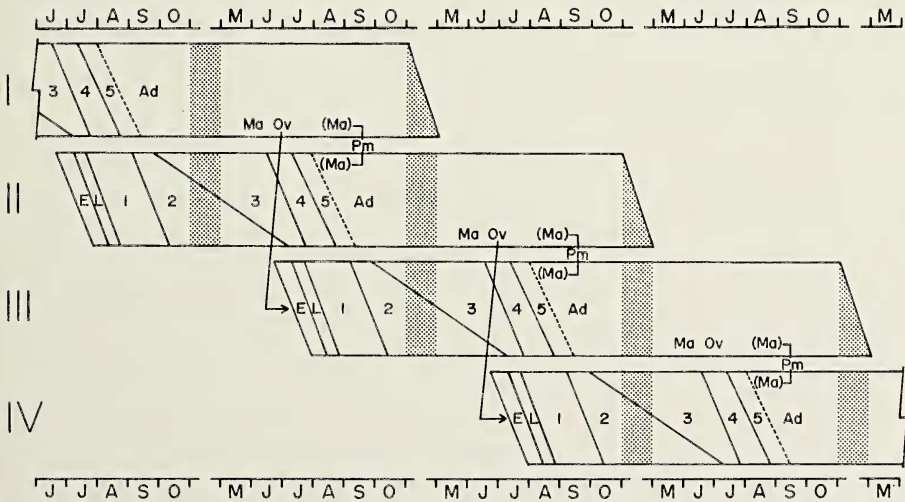


Fig. 9.—Diagram of the life cycle of a Nagano population of *Sitticus fasciger* in four years. E = egg, L = larva, 1, 2, 3, 4 & 5 = 1st, 2nd, 3rd, 4th and 5th nymphs, Ad = adult, Ma = mating in the majority, (Ma) = mating in the minority, Ov = oviposition, Pm = probable mating between different generations. Dotted areas show the periods of overwintering. Scales on the top and the bottom show months of four years.

show the possibility of such intergenerational copulation, i.e., that a few virgin females copulate with the surviving males in the late summer (Pm in Fig. 9).

In Tokyo, a last nymph of a female has been collected on April 24. Tokyo is 4.2°C warmer than Nagano Prefecture in annual mean temperature. Therefore, in Tokyo, spiders must be mature in late spring of the year following hatching and they copulate and oviposit by late summer. This life cycle is identical with that of some other salticids (Gardner 1965; Miyashita 1969; Wild 1969; Horner and Starks 1972).

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